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test the power of bees to return to their nests when carried to a distance; a considerable number returned safely.—*Ammophila hirsuta*, says Fabre, searches for the larvæ of *Agrotis segetum*, which are detected under the surface of the ground by some apparently unknown sense. The larva is carefully paralyzed in every segment before being buried, which leads the author to conclude that the *Ammophila* originally preyed on insects more easily paralyzed, and as it gradually attacked larger insects, its instincts enlarged, and became hereditary.—W. F. Kirby finds that hybrids between *Smerinthus ocellatus* and *populi* usually show traces of hermaphroditism, which seems to indicate that hermaphroditism is encouraged by hybridity, and that the usual sterility of hybrids may be due to this cause.

ZOOLOGY.

ANOTHER VORTICELLA WITH TWO CONTRACTILE VESICLES.—In the NATURALIST for August, 1884, the writer described a new infusorian belonging to the genus *Vorticella*, under the name *Vorticella lockwoodii*, one of the peculiarities of which was the possession of two contractile vesicles, that being the first recorded instance of the occurrence of more than a single pulsating vacuole in any of the numerous species. Now, however, I desire to state that a similar arrangement obtains in the well-known *Vorticella monilata* Tatem, a species originally discovered in English waters, and by no means uncommon on the continent of Europe or in this country. It therefore seems somewhat surprising that the presence of the two vesicles in this widely distributed form should have hitherto eluded observation. The species occurs in this locality in some profusion, a colony recently taken attached to *Myriophyllum* from my aquarium being formed, by actual count, of two hundred individuals, another of eighty-three, smaller collections not being rare. With these I have been able to positively determine and demonstrate to a friend the presence of two contractile vesicles which, when the vorticella is in the proper position, are distinctly visible without a change of focus. The fact of their presence is of interest since it is a point in the anatomy of these minute creatures not previously noted.—*Dr. Alfred C. Stokes, Trenton, N. J.*

CUVIERIAN ORGANS OF THE COTTON-SPINNER.—Professor F. Jeffrey Bell gives a technical account of this almost unknown British Holothurian, which is of interest as being the only true—that is, aspidochirotous (or with shield-shaped tentacles)—member of the class which is known to occur in British seas. The organ of most importance is that which produces the sticky secretion from which these animals have obtained their name, and which makes them objects of much dread to the Cornish fishermen. The producing or cuvierian organs are described as forming a solid mass which occupies a large portion of the body—

cavity, and which is made up of a number of separate tubes; a small coiled portion was found lying in the cloaca as if ready for ejection. A small piece of a tube, measuring only 2.5^{mm}, was found even after twenty years' immersion in spirit, to be capable of extension to twelve times its own length; while, when treated with water, the attenuated thread swells up to seven times its own breadth. "We can thus understand that an animal at whom these threads are thrown should, as it attempts to escape, lengthen the threads which, at the same time, coming into contact with the water, would be swollen out transversely as they were extended longitudinally." Professor Bell thinks that the observations confirm the view of Semper as to the protective or offensive character of these organs, which, by Jäger and most later anatomists, have been thought to be renal in function.

In a subsequent note Professor Bell states that six threads, any one of which was only barely visible, were capable of supporting a weight of nearly a thousand grains; and quotes a letter from a correspondent to say that the black holothurians near Porto-Fino, emit a tangled mass of white threads so sticky and in such quantity that it was difficult to free the hands from them.—*Journal of the Royal Microscopical Society*, December, 1884.

EARTH-WORMS.—An interesting paper on the habits of earth-worms in New Zealand is contributed to the New Zealand Institute by Mr. A. T. Urquhart. The species are not named, but with such wonderful opportunities as Mr. Urquhart possesses for making a collection of these, may we hope that, in addition to his following out his observations as to their habits, he will also advance science by making a careful collection of the forms and placing them in the hands of some of the able naturalists of the Auckland Institute for description? It will be remembered that Darwin assumes that in old pastures there may be 26,886 worms per acre, and that Hensen gives 53,767 worms per acre for garden ground and about half that number in cornfields. Mr. Urquhart gives, as the result of his investigations of an acre of pasture land near Auckland, the large number of 348,480 worms as found therein. It being suggested to him that in his selection of the spots for examination he may have unconsciously selected the richest, the experiment was again tried in a field seventeen years in grass. A piece was laid out into squares of 120 feet, and a square foot of soil was taken out of each corner; worms hanging to the side walls of the holes were not counted, and in one hole, where the return of worms was a blank, the walls were crowded with worms. As a result there was an average of eighteen worms per square foot, or 784,080 per acre. Although this average is very striking when compared with that of Hensen, it is worthy of note that the difference between the actual weight of the worms is not so marked. According to Hensen, his average of 53,767

worms would weigh 356 pounds, while Mr. Urquhart finds that the average weight of the number found by him came to 612 pounds 9 ounces.—*Scientific American*.

DEEP-SEA EXPLORATIONS OF LAST SUMMER BY THE U. S. FISH COMMISSION.—Professor Verrill reports that the zoölogical results this year were of great interest. Many additions to the fauna of great depths were made, and a large proportion of them are undescribed forms. Some of the fishes were of great interest. Huge spiny spider-crabs (*Lithodes agassizii*) over three feet across were taken in 1000 to 1230 fathoms, and another very large crab (*Geryon*) occurred in great abundance in 500 to 1000 fathoms, while in 2574 fathoms a large and strong crab-like creature (*Munidopsis*) was taken. Many curious shrimp, some of them of large size and brightly colored, and often with perfect eyes, occurred in most of the deepest dredgings. Several very interesting new forms of star-fishes, ophiurans, and holothurians were dredged, some of them in large quantities, even in the deepest localities. Several interesting new forms of corals, gorgonians, sea-pens, and allied forms also occurred. Numerous specimens of huge sea-urchins with flexible shells (*Phormosoma uranus*) were obtained from several different stations, in 600 to 1100 fathoms. Some of these are about ten inches broad. One sea-urchin (*Aspidodiadema*), not before observed north of the West Indies, was taken in 991 fathoms. Most of the deep-sea star-fishes belong to the genus *Archaster* and other closely related genera. Some of these, like *A. agassizii* and *A. grandis*, were taken in large numbers, several hundreds in a single haul. And the same often happens with several of the ophiurans and sea-urchins. One interesting stalked crinoid (*Rhizocrinus*) was obtained in 2021 fathoms.

Many additions were made to the Mollusca. In July, Professor Verrill published a general list of all the deep-water Mollusca taken in the gulf stream region off this coast, up to the end of 1883. That list included 338 deep-water species and 42 that inhabit the surface waters. This year about 25 deep-sea species and about 8 from the surface were added to the list, making the total number over 400 species. Among the new forms discovered this year are four or five species of cephalopods, some of them very remarkable, and representing new genera. There were some very interesting new shells, some of them of good size and well developed, from below 2000 fathoms. Most of the larger and finer ones from the very deep waters belong to the *Pleurotoma* group, but some large species are allied to *Sipho* (or *Fusus*) and to *Dolium*. Numerous specimens of three rare species of brachiopods were also dredged from below 1000 fathoms. These are *Discina atlantica*, *Waldheimia cranium* and *Atrertia gnomon*. The latter has not been known before from this side of the Atlantic.

ANATOMY OF A CATFISH.—Professor R. Ramsay Wright, with Professor J. P. McMurrich, A. B. McCallum and T. McKenzie,

have published in the Proceedings of the Canadian Institute of Toronto "Contributions to the anatomy of Amiurus." The papers serve as a contribution to the morphology of a comparatively little known family of fishes, and will also be of use to teachers of comparative anatomy. The skin and cutaneous sense-organs as well as the nervous system and sense-organs are described and figured by Professor Wright; the osteology and myology by Professor McMurrich, the alimentary canal, liver, pancreas and air-bladder by Mr. McCallum, which Mr. McKenzie has worked out the blood-vascular system, ductless glands and urogenital system. The work comprises 206 pages, and is illustrated by eight folding heliotypic plates.

Professor Wright describes certain structures which are apparently comparable to the nerve-sacs of the ganoids; he also discusses the relationship between the air-bladder and the auditory labyrinth. The work is another of the monographic essays now appearing from time to time, and affords the modern student aids and facilities such as were entirely unknown a generation ago.

THE SPIRACLES OF AMIA AND LEPIDOSTEUS.—My note on this subject in the February NATURALIST requires modification, in so far as what I took to be the oral aperture of the spiracle in *Amia* is really the aperture of a canal in which the pseudobranchia lies, and into which the spiracular cleft opens further forwards. The pseudobranchia of *Amia* is homologous with the upper (non-respiratory) part of the opercular gill in *Lepidosteus*; both are innervated by the anterior branch of the glossopharyngeus, but the pseudobranchia of *Lepidosteus* is free, while that of *Amia* is concealed in what may be termed a pseudobranchial canal. The singular continuity of this canal with the spiracular cleft induced me to believe that I had found evidence to justify Dohrn's criticism of Gegenbaur's views as to the homology of the pseudobranchia of the Teleosts, but I am now convinced that the condition of the parts in *Amia* proves Gegenbaur's position to be correct.—*R. Ramsay Wright, University College, Toronto, February 10, 1885.*

BIRDS OUT OF SEASON—A TRAGEDY.—Our winter so far has been one of unusual severity, such low temperatures as -20° to -35° having prevailed quite often. Whole weeks have passed in which the mercury has not risen above zero! But during all this time, until the afternoon of the 18th instant—"a chewink" (*Pipilo erythrophthalmus*) has lived about my orchard and barnyard. I am unaccustomed to seeing much of this species, except in early spring, upon their return from the South. It breeds here, but is a very quiet bird through the summer and autumn—at least, it has only been upon rare occasions that I have seen it. But soon after winter set in I saw the one in question in the barnyard, where he seemed to be feeding upon some scattered grain. Later I found him one very cold afternoon in a "straw-built shed,"

where I easily caught him. After looking him over, and comparing him with Dr. Brewer's lucid description, I let him go. Catching him did not seem to have caused him any alarm or discomfort, for he remained about the premises quite as tame and sprightly as usual.

In addition to the chewink, a robin has also been a frequent visitant here. We saw him some days ago, and again last night, when the mercury was down to -20° . But it is not at all unusual for robins to be here in winter, though I do not remember having ever seen more than one at a time.

On the afternoon of the 18th instant, our dear little chewink, which we had come to regard with great solicitude, met with a very sad fate. \Going into the barnyard, I saw a couple of birds dart down to the side of a hay-stack. One was a jay, and at the first glance I thought the other was also. But in an instant it occurred to me that the jay was killing the under bird. I sprang forward hoping to rescue it. I was just an instant too late—for the jay picked up the bird, now dead, and flew away with it! The load was a heavy one, and as the cannibal flew off across a ravine, it bore him down almost to the ground. The quick glimpse I had of the glossy black head and back, the chestnut sides, and the white under parts, showed that it was our poor chewink—whose fortitude in braving our terrible winter had met with a sad requital. I have always defended the blue jays, though I know they are addicted to a great deal of "crookedness" in their treatment of other species of birds; but this incident has quite disgusted me with them.—*Charles Aldrich, Webster City, Iowa, Jan. 29, 1885.*

HOW FAR DOES THE JERBOA JUMP?—On page 71, of his most entertaining volume, *A Naturalist's Rambles about Home*, Dr. Charles C. Abbott, in speaking of the pretty "kangaroo or jumping-mouse," quotes Godman to the effect that it leaps "five or six feet at every spring;" but expresses a doubt on the subject. He says: "Without the means of determining this point, I should judge that one-half that distance was more nearly correct." While living at my old boyhood home, in Cattaraugus county, New York—forty years ago—I used occasionally to see one of these very interesting little animals. The first one I ever saw was in the meadow, where I was raking hay with a common, old-fashioned hand-rake. The mouse made a sudden spring, and I "went for it" with my rake. After chasing it two or three rods I hit it with the rake-head and killed it. My recollection is very distinct, that it "leaped at least five or six feet," at the start—though it appeared to tire out very quickly, reducing the length of its leaps to not more than two or three feet. I conclude that both writers have recalled their observations correctly, and that the condition of the animal, possibly also its age, may determine its jumping capacity. I remember that in this, as in other

instances, each jump was made in a different direction from the last, so that it was a matter of some difficulty to pursue the little creature! I was exceedingly interested in this first capture—never having seen or heard of one before. One of our farm hands told me that it was a “kangaroo mouse.” After that I saw one occasionally, and my recollection is very clear that Godman does not overstate its ability to jump. I have never seen or heard of one in this region.—*Charles Aldrich, Webster City, Iowa, March 5, 1885.*

EMBRYOLOGY.¹

ON THE PROBABLE ORIGIN, HOMOLOGIES AND DEVELOPMENT OF THE FLUKES OF CETACEANS AND SIRENIANS.—We have seen that the development of the Physoclist fishes (*AM. NATURALIST*, 1885, pp. 315–317), shows that the translocation of the pelvic fins forward is accomplished in some forms in about twenty-four to forty-eight hours, to a position more or less in advance of the pectoral. If a limb-fold can be translocated forwards in a vertebrate embryo from its archaic site, there is no reason to doubt that under certain conditions it might be translocated in the other direction or backwards. A process of translocation of the distal end of the pelvic limbs seems to have occurred in the cetaceans, as a consequence of which the pes has acquired a new position far to the rear of that which it occupies in normal mammals, and this seems to have been accompanied by processes of atrophy in some directions and hypertrophy in others.

The researches of Struthers, Flower, Reinhardt, Eschricht, Kaup, Lepsius, Howes and Wilder, leave no doubt as to the fact that the different rudimentary structures which these anatomists have detected, unequivocally point to the conclusion that, the cetaceans and sirenians have descended from Mammalia which possessed more or less perfectly developed ambulatory limbs, which fitted them at least for an amphibious or partially terrestrial existence. This conclusion is, I believe, generally accepted by recent authorities.

All recent writers, amongst which may be named Flower, Huxley, Owen, Claus and Parker, unequivocally declare that the hind-limbs of the whales and sirenians have been so completely suppressed, that no rudiments or vestiges of any kind have remained to indicate outwardly that these creatures ever possessed such appendages, the evidence that they did once possess hind-limbs resting for them rather upon the presence of a rudimentary pelvis with much reduced limb-bones in a few forms of *Balænoidea* and in *Halitherium*.

From this view the writer must dissent, having independently arrived at conclusions in reference to the homology of the flukes

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